

1. An apparatus for assembling a rigid tube into a flexible hose, comprising:
 - a frame;
 - a first gripper assembly connected to the frame and including a first set of gripper jaws for gripping one of said flexible hose and said rigid tube;
 - a second gripper assembly connected to the frame and including a second set of gripper jaws for gripping the other of said flexible hose and said rigid tube; and
 - an actuator assembly connected to the frame and to the first gripper assembly, for moving the first gripper assembly toward the second gripper assembly to insert the rigid tube into the flexible hose.
2. The apparatus of claim 1, wherein:
 - the first gripper assembly is moveable relative to the frame; and
 - the second gripper assembly is fixed relative to the frame.
3. The apparatus of claim 2, wherein:
 - the frame includes a slide guide;
 - the first gripper assembly is slidably mounted on the slide guide; and
 - the actuator assembly includes a ram connected to the first gripper assembly for sliding the first gripper assembly on the slide guide.
4. The apparatus of claim 1, further comprising:
 - a first trigger operably associated with the first gripper assembly for closing the first set of gripper jaws; and

a second trigger operably associated with the second gripper assembly and with the actuator assembly, for closing the second set of gripper jaws and then actuating the actuator assembly to move the first gripper assembly toward the second gripper assembly.

5. The apparatus of claim 4, wherein:

the frame includes first and second spaced handles; and

the first and second triggers are located on the first and second handles, respectively.

6. The apparatus of claim 1, wherein:

the first set of gripper jaws are adapted to grip the flexible hose; and

the second set of gripper jaws are adapted to grip the rigid tube.

7. The apparatus of claim 1, further comprising:

a counterbalance; and

a connector on the frame for suspending the frame from the counterbalance so that a human operator can move the frame about without supporting the weight of the frame.

8. The apparatus of claim 7, wherein:

the first and second gripper assemblies and the actuator assembly are arranged so that the movement of the first gripper assembly toward the second

gripper assembly is in a generally horizontal direction when the frame is suspended from the counterbalance.

9. The apparatus of claim 1, wherein:

one of said pairs of jaws includes a pair of partially cylindrical elongated support surfaces for gripping and supporting a flexible hose.

10. The apparatus of claim 1, further comprising:

first and second triggers, operably associated with the first and second gripper assemblies, respectively; and

wherein the frame includes first and second handles, having the first and second triggers, respectively, mounted thereon.

11. The apparatus of claim 10, wherein:

one of the handles extends vertically and has an upper end with a connector on the upper end so that the frame can be suspended from an overhead support.

12. The apparatus of claim 11, wherein:

the other handle extends generally downward.

13. The apparatus of claim 1, further comprising:

first and second triggers; and

a control system, operably connecting the first and second triggers to the first and second gripper assemblies and to the actuator assembly, so that:

actuation of the first trigger closes the first gripper assembly; and

actuation of the second trigger assembly closes the second gripper assembly and then causes the actuator assembly to move the first gripper assembly toward the second gripper assembly.

14. The apparatus of claim 13, wherein:

the control system requires the first trigger to remain actuated during the actuation of the second trigger.

15. The apparatus of claim 13, wherein:

the control system requires the second trigger to be released before the first gripper assembly can be opened.

16. An apparatus for automated assembly of first and second components on an assembly line, comprising:

a moveable frame adapted to be moveable relative to the assembly line so that the frame can be oriented relative to one of the components on the assembly line;

a first holder assembly mounted on the frame and adapted to hold said first component;

a second holder assembly mounted on the frame and adapted to hold the second component; and

an actuator assembly connected to the frame and the first holder assembly for moving the first holder assembly toward the second holder assembly to insert one of the components into the other of the components.

17. The apparatus of claim 16, wherein:

the first holder assembly is moveable relative to the frame; and

the second holder assembly is fixed relative to the frame.

18. The apparatus of claim 17, wherein:

the frame includes a slide guide;

the first holder assembly is slidably mounted on the slide guide; and

the actuator assembly includes a ram connected to the first holder assembly for sliding the first holder assembly on the slide guide.

19. The apparatus of claim 16, further comprising:

a first trigger operably associated with the first holder assembly for closing the first holder assembly to hold a first component; and

a second trigger operably associated with the second holder assembly and with the actuator assembly, for closing the second holder assembly and then actuating the actuator assembly to move the first holder assembly toward the second holder assembly.

20. The apparatus of claim 19, wherein:

the frame includes first and second spaced handles; and

the first and second triggers are located on the first and second handles,
respectively.

21. The apparatus of claim 16, further comprising:

a counterbalance; and

a connector on the frame for suspending the frame from the counterbalance
so that a human operator can move the frame about without supporting the weight
of the frame.

22. A component installation apparatus, comprising:

a manually manipulatable frame, including a guide;

a first gripper assembly mounted on the guide for movement relative to the
frame, and including a first pair of jaws;

a second gripper assembly, connected to the frame, and including a second
pair of jaws aligned with the first pair of jaws; and

an actuator connected between the frame and the first gripper assembly and
arranged to move the first gripper assembly back and forth upon the guide.

23. The apparatus of claim 22, wherein:

one of said pairs of jaws includes a pair of partially cylindrical elongated support surfaces for gripping and supporting a flexible hose.

24. The apparatus of claim 22, further comprising:

first and second triggers, operably associated with the first and second gripper assemblies, respectively; and

wherein the frame includes first and second handles, having the first and second triggers, respectively, mounted thereon.

25. The apparatus of claim 24, wherein:

one of the handles extends vertically and has an upper end with a connector on the upper end so that the frame can be suspended from an overhead support.

26. The apparatus of claim 25, wherein:

the other handle extends generally downward.

27. The apparatus of claim 22, further comprising:

first and second triggers; and

a control system, operably connecting the first and second triggers to the first and second gripper assemblies and to the actuator, so that:

actuation of the first trigger closes the first gripper assembly; and

actuation of the second trigger assembly closes the second gripper assembly and then causes the actuator to move the first gripper assembly toward the second gripper assembly.

28. The apparatus of claim 27, wherein:

the control system requires the first trigger to remain actuated during the actuation of the second trigger.

29. The apparatus of claim 27, wherein:

the control system requires the second trigger to be released before the first gripper assembly can be opened.

30. A method of assembling a flexible hose and a rigid tube, comprising:

(a) gripping the flexible hose with a first pair of powered jaws mounted on a frame;

(b) gripping the rigid tube with a second pair of powered jaws mounted on the frame; and

(c) moving the first pair of powered jaws toward the second pair of powered jaws with power assistance, and thereby inserting the rigid tube into the flexible hose.

31. The method of claim 30, wherein:

the gripping of step (a) is maintained throughout steps (b) and (c).

32. The method of claim 30, further comprising:

prior to step (a), suspending the frame from a counterbalance, and
during step (c), supporting the frame from the counterbalance.

33. The method of claim 30, wherein:

step (a) includes gripping the flexible hose between a pair of opposed partially cylindrical support surfaces on the first pair of powered jaws, with a free end of the flexible hose extending beyond the support surfaces toward the second pair of powered jaws; and

after initiation of step (a), and before step (b), moving the frame and abutting the free end of the flexible hose with a free end of the rigid tube, so that the hose and tube are aligned.

34. The method of claim 30, further comprising:

actuating a first trigger with a first hand of a human operator to initiate step (a); and

actuating a second trigger with the operator's other hand to initiate step (b).

35. The method of claim 34, further comprising:

gripping two spaced handles having the first and second triggers mounted thereon, and manually manipulating the frame to align the flexible hose with the rigid tube prior to step (b).